case of the lizard, must be of use to the rodent when pursued by shepherds' dogs, birds of prey, or other enemies, though, unlike the lizard, it is unable to repeat the manœuvre.

These mice were caught alive in traps baited with bread by villagers, who said they were very scarce, though there appeared to be no difficulty in getting as many as I required. They also told me that their holes are very deep and that they are never found in houses, though said to haunt the "mandras" (caves and shelters for goats) in the hills.

They were all caught in the Kerynia Hills, not far from the village of Dikomo. This portion of the south side of the range, which is composed of a grey limestone, is extremely barren, strewn with stones fallen from the rocks and cliffs, and sparsely clothed with low and generally thorny plants. The undulating ground and plain lying below are for the greater part of the year arid and practically destitute of vegetation. Remains of this mouse were found in the earth of a cave in the same locality. I never met with or heard of it in other parts of the island, though probably it occurs at any rate over the whole of the Mesorœa, or central plain, and the southern slopes of the Kerynia Hills.

LXXVIII.—*Notes on the Natural History of East Finmark.*

By Canon A. M. Norman, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from p. 173.]

[Plate XIII.]

POLYZOA.

I have in the following paper on Polyzoa extended the scope of the subject beyond the limit of East Finmarkian species, in order to introduce matter relating to classification and observations on some Arctic and other species. The species which have been found in East Finmark have been numbered, and such species as have no prefixed number will be understood not to have connexion with the fauna of that district.

Herr F. A. Smitt, in 1865–74, published his 'Kritisk Förteckning öfver Skandinaviens Hafs bryozoer.' This work contained an admirable series of illustrations of Scandinavian and Arctic Polyzoa. The figures, though small, were excellent, and they have been and must continue to be

of great value to the student. Smitt was highly conservative with respect to nomenclature, in so far that he adopted existing genera, enlarging or altogether altering their characters so that they might embrace the species with which he was dealing. Indeed, he formed only one new genus—*Anarthropora*—among the Cheilostomata. Moreover, he instituted very few new species, distributing most of the interesting new varieties which he found, as well as many previously described species, under existing names, not calling these freshly acquired Polyzoa varieties, but "*formæ*."

Now it is not far from the truth to say that in the opinion of recent writers these "*formæ*," with few exceptions, are regarded as entitled to specific rank. This is, however, of course, a mere matter of opinion, and his work remains a most valuable contribution to our knowledge of the Polyzoa. He was, moreover, the pioneer who maintained that among the Escharine and Lepralian groups the form which the zoarium assumes is of little value as affording generic or specific characters in comparison with the structure of the individual zoœcia which make up the zoarium, and in the application of this principle he took his characters from the several features of the zoœcium and its appendages. Soon after the publication of his work, through the kindness of Prof. Lovén and Herr Smitt I received in exchange from the Stockholm Museum a very full series of the Polyzoa which were described in the latter's monograph; and these specimens have been of very great value in enabling me to positively determine certain forms.

Smitt, in the work referred to and in his "Bryozoa marina in regionibus arcticis et borealibus viventia," Œfvers. k. Vet.-Akad. Förh. (1867) 1868, p. 443, recorded eighty species and "formæ" from Finmark, but there is no means of knowing in what part of Finmark they had been found.

While Danielssen supplies one or two East Finmark species, our previous knowledge of the Polyzoa of the district is due to papers by Herr O. Nordgaard; one of these is "Norwegian North Atlantic Expedition, Polyzoa," 1900, and the others "Systematisk fortegnelse over de i Norge hidtil observerede arter af marine Polyzoa, I. Cheilostomata," Bergens Mus. Aarbog, 1895, and "II. Cyclostomata," ibid. 1896.

The 'History of British Marine Polyzoa' is a work of the greatest value and importance on the species of our fauna. It is unfortunate that some of the genera which Mr. Hincks founded mainly on the form of the oral opening were so loosely characterized that they admitted forms which have

really little in common. His work, moreover, contained a most serious mistake. He acted in it as though there were no such things as rules of nomenclature, casting aside many old genera as though they never existed and misapplying others. The primary law of nomenclature, which alone can save zoology from hopeless confusion, is that "The name originally given by the founder of a group or the describer of a species should be permanently retained, to the exclusion of all subsequent synonyms." The mistake of Hincks in this matter and the injustice caused to previous writers must sooner or later be rectified. It is to be regretted that this has not been done long since. Verrill has made some corrections, and further delay will only render the necessary changes when made the more serious, as it would allow of the addition of further useless synonyms. I know of no other class in which the law I have referred to has been so ruthlessly set aside. Was it that Hincks was ignorant of all law? or was it that as the characters given to the old genera were totally inadequate from the modern point of view, he considered that they might be disregarded? The answer is that two items remain permanent, unless they be synonyms of earlier described forms—the name of a genus and the name of a species. The definition of a genus or species must of necessity be continually changing with increasing knowledge of the forms themselves and of others more recently discovered which are allied to them. If it were otherwise, could some of Hincks's own genera—say *Schizoporella*, *Smittia*, or *Mucronella*—be at this moment maintained with the definition which he gave to them? The following are instances in which the law of priority was disregarded among the Cheilostomata.

Chorizopora Brongniartii.—The generic name is that of Hincks, the specific of Audouin. Both must yield to *Berenicea prominens*, Lamouroux (Expos. méthod. des Genres de l'Ord. des Polyp. 1821, p. 80, pl. lxxx. figs. 1, 2). The type of Lamouroux's species was from the Mediterranean, and it unquestionably was drawn from the netted state of the species (see Hincks, Brit. Pol. pl. xxxii. fig. 2). There is an earlier genus among Medusæ—*Berenice*, Péron & Lesueur, 1809—but the two generic names are sufficiently distinct.

Schizoporella, Hincks, ought to have been named *Escharina*, H. Milne-Edwards, since it included *E. vulgaris* (Moll) (see Lamarck and Gray). But I have always considered that *E. vulgaris* was wrongly placed by Hincks in his genus, and that its keyhole-like oral opening and the avicularia situated so low down on the zoœcia, with their vibraculoid

character, pointed to much closer relationship to what Hincks called *Mastigophora*. Recently Levinsen (' Studies on Bryozoa,' 1902, p. 26) has intimated his intention of removing some other "*Schizoporellæ*" into the same genus.

Mastigophora, Hincks.—This genus ought not to have been instituted unless the genus *Herentia*, Gray, had been used for some other form, since the first species which Gray placed in the genus was *Herentia Hyndmanni*, the very species which Hincks made the type of his *Mastigophora*. But, as intimated in the preceding paragraph, *Escharina*, H. Milne-Edwards, must apparently take precedence of both these names.

Lepralia, Hincks.—This has no connexion whatever with *Lepralia*, Johnston. It does not contain a single species which Johnston had placed within it when the genus was formed! Moreover, an extraordinary liberty has been taken here. *Eschara foliacea*, the type species of the oldest genus of Cheilostomata except *Cellepora*, is actually submerged in the *Lepralia* of Hincks and the genus slaughtered.

Umbonula, Hincks.—The type *U. verrucosa*, Esper; but this same species is the type of the old genus *Discopora*, Lamarck (see Lamarck and Lamouroux, the latter author deciding the type).

Escharoides of Smitt and Hincks is not *Escharoides*, Lamarck, the type of which is *Cellepora coccinea*, Abildgaard (see Lamarck and Gray, who determine the species intended by their references to Fleming and Johnston).

Mucronella, Hincks.—If some doubt existed as to the species which was described by the name *Cellepora coccinea*, it certainly was either what is now known as *coccinea* or *ventricosa*, Johnston, both of which species were included in the *Mucronella* of Hincks, which therefore ought to have borne the name *Escharoides*, H. Milne-Edwards; but if *M. coccinea* is now placed in a different genus from *M. ventricosa*, as must, I think, be the case, Gray's genus *Escharella*, 1848, should be used for the *ventricosa* group. Gray placed in his genus three species—*immersa*, Fleming (=*Peachii*, Johnston), *violacea*, Johnston, and *variolosa*, Johnston,—the first and third of which would remain in it. *Escharella*, Gray, 1848, is not the subsequently described *Escharella*, d'Orbigny, 1850, nor *Escharella*, Smitt, 1867.

Since the publication of the 'History of British Marine Polyzoa' most valuable work has been carried out by many students on the structure—using the word in its widest sense—of the Escharine Polyzoa. But I shall refer here only

briefly to points which afford the chief assistance in the classification of the forms.

1. *The Compensation-Sac.*

The compensation-sac was first observed by Jullien, and has been lately worked out fully by S. F. Harmer, "On the Structure and Classification of Cheilostomous Polyzoa" (Proc. Cambridge Phil. Soc. vol. xi. 1900, p. 11). The importance of the compensation-sac is so great that it ranks in classification as dividing the order Cheilostomata into two sections, the one provided with and the other not possessing the compensation-sac. The genera which possess a compensation-sac, and which embrace the greater portion of the Escharine and Lepralian forms, Levinsen ("Studies on Bryozoa," Vidensk. Medd. fra den Naturh. Fören. i Kjöbenhavn, 1902, p. 2, separate copy) proposes to unite under the term *Camarostega*.

2. *The Front Wall.*

Jullien rightly called attention to the importance of taking into consideration the structure of the front wall in the classification.

3. *The Operculum.*

Waters, as long ago as 1878, in his paper "The Use of the Opercula in the determination of the Cheilostomatous Bryozoa" (Proc. Manchester Lit. & Phil. Soc. vol. xviii. p. 8), pointed out that the form of the operculum was more reliable in classification than the outline of the oral aperture, since the latter is subject to great modification, while the former is stable. Since that time the operculum has been much studied by Waters, Lorenz, Levinsen, and others. There cannot be a doubt that it is of great value in classification as regards, first, its nature (membranous or calcareous, separable or inseparable); second, its form and structure; and third, the mode of its attachment in the oral opening and the muscular scars which it exhibits.

4. *The so-called 'Rosette-plates' (or 'Origelles' of Jullien) and Pore-chambers.*

These have been chiefly studied by Waters, Jullien, and Levinsen. They are destined to play a very important part in classification. The rosette-plates have been studied for a

long time, but the observations on the pore-chambers are of more recent date. It is Levinsen who has played the chief part in their examination, and he has published figures of those of many species: first in 'Videnskab-Udbytte Kanonbaden "Haughs" Togter,' 1891, pls. ii. & iii., and subsequently in 'Zoologica Danica, Mosdyr,' 1894, pls. iii.–vi. Waters, in some of his more recent papers, and more especially in his "Observations on the Membraniporidæ," Journ. Linn. Soc., Zool. vol. xxvi. 1898, p. 654, has described and illustrated pore-chambers of certain species. I have, in the following paper, made much use of them in dividing the old genus *Membranipora*, as well as in other cases.

5. *The Avicularia.*

Hincks made some use of the avicularia and vibracula in the establishment of certain genera, and they have been, of course, used constantly in specific characters; but these organs deserve far more attention than they have hitherto received. Their structure and their position in the zoarium or zoœcium would seem to constitute often most reliable aid in assigning the forms to what we designate species or genera among the Polyzoa, just as the presence or absence and the forms and position of pedicellariæ have been found of very great importance in the classification of Echinoderma. The foregoing sentence was written some months ago, and in writing it I had more especially in my mind the Asteroidea. I have now (March 1903) just received the beautiful work of Th. Mortensen on the Echinoidea ('The Danish Ingolf Expedition,' vol. iv.—I. Echinoidea, pt. i. 1903). The following sentences are from his work, and are worthy of consideration in connexion with the value of the avicularia of the Polyzoa:—

"The characters which have hitherto chiefly been used for the distinguishing between the genera and species are the following: the pores, the spines, the tubercles, the mouth-slits, the lining of the buccal membrane with larger or smaller plates, and the calycinal area. All these structures may give excellent characters, and, of course, they are always to be taken into consideration. But most frequently they are so relative, that it is exceedingly difficult or impossible, by means of these structures, to decide whether a specimen in hand belongs to one species or another . . . By these researches the pedicellariæ and spicules proved to be of very great systematic value; they give the most excellent characters we may want. . . *The pedicellariæ in effect give absolutely excellent systematic characters*, sometimes only specific

characters, sometimes also generic ones. . . It may, perhaps, seem unreasonable to lay so much stress, as is done here, on so minute features as the pedicellariæ—to use them for the characterizing of as well species as genera and families. But when it proves to be a real fact that these minute features give excellent constant characters, it may be taken to be reasonable to use them without regard to their being small or large . . . The supposition by Stewart that by the examination of the pedicellariæ &c. we might find a closer relation between forms not otherwise regarded as related, has been amply justified by these researches, even to so high a degree that the classification hitherto used proves to be quite a failure (with regards to the groups treated of here). A good proof of the correctness of the new classification given here, which has been found especially by the examination of the pedicellariæ, is found in the fact that forms with the same kind of pedicellariæ also agree in other important respects."

The avicularia have been little used in the classification of Polyzoa, but I am satisfied that they are destined to play a far more prominent part in the future. In some genera Hincks made use of them with good results; in others he disregarded them altogether and left genera (e. g. *Membranipora, Schizoporella, Mucronella,* and *Lepralia*) to contain a most miscellaneous assemblage of species. Busk, in his 'Challenger' Report, used them with satisfactory result, especially as applied to the very difficult genus *Cellepora*. But the following sentences from the paper by Waters, "Observations on the Membraniporidæ" (Journ. Linn. Soc., Zool. vol. xxvi. 1898, pp. 655–657) relate to a more minute point among his "Membraniporidæ." He says: "the avicularium only exceptionally has a complete bar." Then writing of an aberrant group (the genus *Chaperia,* Jullien) he says: "Kirkpatrick refers *Chaperia acanthina,* Q. & G., to *Lepralia,* but in *Chaperia* the avicularia have not a complete bar; whereas in all the *Lepraliæ* I have examined the bar is complete, and the muscular attachment of *Lepralia* is not quite similar." I have confirmed Waters's statement as to the incomplete bar in the avicularia of *Membranipora* in the following species: *flustroides, lineata, craticula, aurita, Dumerillii, unicornis, armifera, Sophiæ, nigrans, tenuirostris, granulifera, trifolium,* and *Flemingii*. But the bar is incomplete also in other genera, e. g. *Lepralia nitida, Reptadeonella violacea, Cribilina punctata, innominata,* and *radiata,* and *Mucronella* (?) *pavonella*; while it is complete in *Cribrilina figularis, Chorizopora Brongniartii, Microporella ciliata, Schizoporella unicornis, linearis,* and other species of the genus, *Smittia trispinosa,*

reticulata, and many of their allies which I have examined. The absence of the complete bar seems therefore to be nearly general among the Membraniporidæ, but to occur also in some other instances. The interest of this question lies in affording evidence that not only the presence or absence of avicularia, or their general form when present, is worthy of consideration, but even such minute points in regard to the building up of the avicularium itself as this little slender bar.

But the bar is not always incomplete among what have been called Membraniporidæ. It would seem that in cases when the oval or oblong avicularium occupies a distinct chamber apart from the zoœcium the bar is complete; this is the case in *Oochilina crassimarginata* and *tensa* and *Lernacicus corniger*.

Class **POLYZOA.**

Subclass I. *ENTOPROCTA.*

Genus Loxosoma, Keferstein.

1. *Loxosoma phascolosomatum*, C. Vogt.

Bög Fiord on *Phascolion*.

Genus Pedicellina, M. Sars.

2. *Pedicellina cernua* (Pallas).

Var. *belgica*, J. van Beneden, = var. *glabra*, Hincks.

The smooth-stemmed variety of *P. cernua* was taken between tide-marks at Vadsö.

Subclass II. *ECTOPROCTA.*

Order GYMNOLÆMATA.

Suborder I. Cyclostomata.

Genus Crisia, Lamouroux.

3. *Crisia denticulata* (Lamarck).

Varanger Fiord down to 150 fathoms; and also in Bög and Lang Fiords; and it was dredged by the Norwegian North Atlantic Expedition off Vardö in 148 fathoms.

4. *Crisia eburnea* (Linné).

Between tide-marks at Vadsö.

Genus Stomatopora, Bronn.

5. *Stomatopora fungia* (Couch).
Sværholt (*Nordgaard*).

Genus Idmonea, Lamouroux.

6. *Idmonea atlantica*, E. Forbes.
Vardö ; Vadsö ; Lang and Bög Fiords ; also at Svolvær.

7. *Idmonea serpens* (Linné).
Vadsö (*Danielssen*)*.

Genus Diastopora, Lamouroux.

8. *Diastopora obelia*, Johnston.
On Hydroids from Vardö fishing-boats.

Genus Hornera, Lamouroux.

9. *Hornera lichenoides* (Linné).
Bög Fiord, in 120 fathoms (*A. M. N.*) ; Vadsö (*Danielssen*).

Genus Lichenopora, Defrance.

10. *Lichenopora hispida* (Fleming).
Vadsö, at entrance of harbour ; and Nordgaard records it from Sværholt.

11. *Lichenopora verrucaria*, Fabricius.
Sværholt (*Nordgaard*).

Genus Defrancia, Bronn.

12. *Defrancia lucernaria*, M. Sars.

1851. *Tubulipora lucernaria*, M. Sars, "Beretning om en i Sommeren 1849 foretagen zoologisk Reise i Lofoten og Finmark," Nyt Mag. Naturvid. vol. vi. p. 25 (separate copy).
1856. *Defrancia truncata*, Busk, Ann. & Mag. Nat. Hist. ser. 2, vol. xviii. p. 35, pl. i. figs. 8 *a*, *b* (non *Millepora truncata*, Jameson).
1862. *Defrancia lucernaria*, M. Sars, "Beskrivelse over nogle norske Polyzoer," Vidensk.-Selskab. Förhand. p. 26 (separate copy).

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* Danielssen, 'Beretning om zoologisk Reise foretagen i Sommeren 1857.' Christiania, 1859.

1875. *Defrancia lucernaria*, Busk, Cat. Marine Polyzoa, Brit. Mus. pt. iii. Cyclostomata, p. 36, pl. xxxiii. fig. 3.
1900. *Defrancia lucernaria*, Nordgaard, Norwegian N. Atlantic Exped. pt. xxvii. Polyzoa, p. 20, pl. i. figs. 16, 17.

Vadsö (*M. Sars*); Porsanger Fiord, 'Voringen' (*Nordgaard*). I have also found this species at Florö in West Norway.

Suborder II. Ctenostomata.

Genus Alcyonidium, Lamouroux.

*13. *Alcyonidium hirsutum* (Fleming).

1863. *Alcyonidium papillosum*, Smitt, "Kritisk Förteckning, &c." pt. ii., Öfvers. Kongl. Vet.-Akad. Förhand. pp. 499, 516, pl. xii. figs. 20, 21.

As has been pointed out by Hincks, the *A. hirsutum* of Smitt is not this species but *A. mamillatum*, Alder, and *A. lineare*, Hincks.

I did not take this species in East Finmark, but found the encrusting form on *Fucus* at Svolvær, Lofoten Islands.

14. *Alcyonidium gelatinosum* (Linné).

Taken by the Norwegian North Atlantic Expedition in the Porsanger Fiord.

Genus Flustrella, Gray.

*15. *Flustrella hispida* (Fabricius).

Svolvær, Lofoten Islands.

16. *Flustrella corniculata* (Smitt).

1871. *Alcyonidium corniculatum*, Smitt, "Kritisk Förteckning, &c." pt. v., Öfvers. Kongl. Vet.-Akad. Förhand. p. 1123, pl. xx. figs. 10–16.

The clusters of zoœcia of this species were found wrapped round the stems of *Gemellaria loricata* living between tide-marks at Vadsö. It has previously been found at Spitsbergen and in the sea to the north of Norway; but not on the Norwegian coast.

Genus Cylindrœcium, Hincks.

17. *Cylindrœcium dilatatum*, Hincks.

1856. *Arenella fusca*, Busk, Quart. Journ. Micr. Sci. vol. iv. p. 94, pl. iii. fig. 6 (but not *A. fusca*, Dalyell).
1860. *Farrella dilatata*, Hincks, Quart. Journ. Micr. Sci. vol. viii. p. 279, pl. xxx. fig. 7.

1866. *Vesicularia fusca* (forma simplex), Smitt, "Kritisk Förteckning, &c." pt. ii., Œfvers. Kongl. Vet.-Akad. Förhand. pp. 503, 524, pl. xiii. fig. 38.
1880. *Cylindrœcium dilatatum*, Hincks, Brit. Marine Polyzoa, p. 536, pl. lxxviii. figs. 1, 2, pl. lxxix. figs. 1–3.

In Lang Fiord, on *Bugula Murrayana*. I also found this species at Florö in 1882. The length of the zoœcia is about 1·5 millim.

Suborder III. Cheilostomata, Busk.

Genus Gemellaria, Savigny.

18. *Gemellaria loricata*, Linné.

Tide-marks, Vadsö, and dredged in 120 fathoms in Bög Fiord.

This deep-water form is very delicate and drawn out; the space between the apertures is greater, often much greater, than the length of the apertures. The form is more produced than that figured by Smitt, and much more produced than the tide-mark Vadsö form and usual British specimens. It thus diverges from the type in the opposite direction from the Gulf of St. Lawrence variety, which was named by Dawson *G. Willisii* (see Hincks, pl. iii. fig. 3).

Genus Bugulopsis, Verrill, 1879.

(Amer. Journ. Science & Arts, Brief Contrib. xliii. vol. xviii. p. 53; and Proc. U.S. Nat. Mus. 1879, no. 190.)

= *Cellularia*, Busk (nec *Cellularia*, Pallas).

Type, *Bugulopsis Peachii* (Busk).

19. *Bugulopsis Peachii* (Busk) = *Cellularia Peachii*, Busk.

Varanger Fiord, in 100–150 fathoms. Verrill in 1879 gave the name *Bugulopsis* to receive the species assigned to *Cellularia* by Busk, a position which could not be maintained. No true *Cellularia* was found in East Finmark; but to explain the use here of the genus *Bugulopsis* I add the following history of *Cellularia* :—

Cellularia, Pallas.

= *Cellaria*, Lamouroux & Hincks, = *Salicornaria*, Cuvier.

The genus *Cellularia* cannot be used in the sense in which Busk and Hincks have employed it for the following reasons :—Pallas, the author of the genus *Cellularia*, divided it into sections, the first of which was thus defined "Cellulariæ geniculatæ, undique cellulosæ," and in it were placed

three species, *C. opuntoides*, *C. salicornaria*, and *C. filiformis*. The second of these is the *Eschara fistulosa*, Linné, and was figured by Ellis on plate xxiii. In Ellis and Solander's work we find the spelling of the name changed, without any reason, to *Cellaria*.

Lamouroux, when he refers to the genus, adopts the spelling *Cellaria*, quotes *Cellularia*, Pallas, as a synonym, and retains only two of the species of Pallas in the genus—*C. salicornaria* and *C. opuntoides*. The spelling of the name was simply changed, the genus is the same, its type *C. salicornaria*. *Cellaria* must disappear as being an absolute synonym of *Cellularia*. In 1817 Cuvier made what was already the type of *Cellularia* the type of a new genus which he named *Salicornaria*. Now "*Cellularia*, Pallas" (sic), has been employed by Busk and Hincks in an entirely different sense; and as used by them *does not contain any species placed by Pallas in his genus*. Under any circumstances therefore—that is, if a type of *Cellularia* had not at a very early date been indicated—Busk's usage could not be maintained. The remarks of Hincks (Brit. Polyz. p. 104) should be consulted also on this point. That author took a step in the right direction when he went back to Solander and Ellis and to Lamouroux, but a step further was required to that excellent author Pallas; and Hincks, unfortunately, used both the names *Cellaria* and *Cellularia*. His *Cellaria fistulosa* must become *Cellularia fistulosa*.

Genus Menipea, Lamouroux.

= *Tricellaria*, Fleming, 1828, = *Cellarina*, J. van Beneden, 1848.

I think it very doubtful whether Lamouroux's genus can be employed for the northern forms placed in it; Verrill considers that it cannot. *Tricellaria*, which is the next generic name in date, would scarcely be applicable. There remains *Cellarina*, J. van Beneden.

20. *Menipea ternata* (Ellis & Solander).

Vardö and Vadsö (*A. M. N.*); Nordkyn and Sværholt (*Nordgaard*).

21. *Menipea gracilis* (J. van Beneden).

1848. *Cellarina gracilis*, J. van Beneden, "Recherches sur les Polypes Bryozoaires de la Mer du Nord," Bull. Acad. Brux. vol. xv. p. 41, figs. 1, 2.

I am indebted to the late Prof. J. van Beneden for a portion of the type specimen of his *Cellarina gracilis* in the

Brussels Museum; and it is undoubtedly the same as *C. ternata*, var. *gracilis*, of Smitt, and *M. gracilis*, Busk; so that although the name is not changed, it must be assigned to the first-named instead of the last author. Although Van Beneden's lower figure (fig. 2) looks more like *ternata* from its set of three zoœcia, it is merely accidental; for while *M. gracilis* usually has five to nine or even twelve zoœcia in an internode, there may sometimes be found as few as three.

In Van Beneden's *Cellarina gracilis*, as illustrated by the fragment in my possession, which he kindly cut for me in my presence from the type, the lateral avicularia are larger than usual, there is no medium avicularium, the fornix or scutum is of moderate size, and there are two or three oral spines (Van Beneden figures four on young zoœcia); the median zoœcium has no central mucro. Smitt's figure 23 most nearly represents it, but the lateral avicularia are larger; Van Beneden's specimen is exactly like some from Spitsbergen, for which I am indebted to Herr Smitt.

Vardö, Varanger and Sydvaranger Fiords.

A form was dredged in 125–150 fathoms in the Varanger Fiord in which the spines of the zoœcium attained very great development. There were in this form usually three mouth-spines, two of which are of great length, and one of them extraordinarily so, it being from three to four times the length of the zoœcium from which it springs.

22. *Menipea Jeffreysi*, Norman.

1893. *Menipea Jeffreysi*, Norman, "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 446, pl. xix. fig. 1.

A small fragment in Bög Fiord, 150 fathoms.

Genus Scrupocellaria, J. van Beneden.

23. *Scrupocellaria scabra*, J. van Beneden.

Varanger and Sydvaranger Fiords (*A. M. N.*), Nordkyn (*Nordgaard*).

Var. *pœnulata*, nom. nov.

1893. *Scrupocellaria scabra*, var., Hincks, "The Polyzoa of the St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 427, pl. xxi. fig. 1.

The remarkable form of *Scrupocellaria scabra* described and excellently figured by Hincks in his paper referred to occurs also in East Finmark, where I obtained it among the

rejectamenta of the fishing-boats at Vardö and by dredging in Bög Fiord in 120 fathoms. The great development of the fornix is exactly as represented by Hincks. It not only covers the entire oral opening but extends forwards to about half the length of the œcium. The frontal avicularia are apparently entirely absent; but a vibracular cell of the unusual character peculiar to *S. scabra* is occasionally, though very rarely, developed. These, however, Hincks failed to find, and upon this ground pointed out that one of the characters which distinguishes *Scrupocellaria* from *Menipea* broke down. These vibracular appendages are usually pretty freely developed on British examples of the typical form, but are rarely present in all the Finmarkian varieties of the species.

Var. *septentrionalis*, nom. nov., subvar. *congesta*, nom. nov.

At Vadsö, between tide-marks, occurred a form of *S. scabra* which in all essential details, in the small size of the lateral avicularia, in the free development of small frontal avicularia, and in the rudimentary character of the fornix, agrees with var. *elongata*, Smitt; and in all these points it has characters which are the exact opposites of those of var. *pœnulata* in relation to the typical form of the species. But while thus far agreeing with var. *elongata* it is anything but elongated, indeed just the reverse, for the zoœcia are closely crowded together, so that each overlaps its successor to the extent of nearly half the length of the area; thus the aspect of the entire polyzoary is that of a stout little bush. As the name *elongata*, therefore, is not applicable, I propose a varietal name, *septentrionalis*, with two subvarieties: 1. *elongata*; 2. *congesta*.

Genus Caberea, Lamouroux.

24. *Caberea Ellisii* (Fleming).

Vardö fishing-boats and Lang Fiord (*A. M. N.*); Sværholt (*Nordgaard*).

Genus Kinekoskias, Danielssen.

25. *Kinekoskias arborescens*, Danielssen.

1867. *Kinekoskias arborescens*, Danielssen, Förhand. Videns.-Selskab. Christiania, p. 23 (*fide* Koren and Danielssen, this paper not being in my library).

1867. *Bugula umbella*, Smitt, "Kritisk Förteckning, &c.," Œfvers. K. Vet.-Akad. Förhand. pp. 292 & 353, pl. xix. figs. 28-31.

1877. *Kinekoskias arborescens*, Koren and Danielssen, Fauna Littoralis Norvegiæ, part 3, p. 107, pl. xii. figs. 9–14.
1894. *Kinekoskias arborescens*, Norman, "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. p. 113.

The two type "specimens of this species were found by Danielssen at Vadsö at a depth of 90 fathoms on a clayey sand bottom."

Genus Bugula, Oken.

26. *Bugula purpurotincta*, Norman.

Lang Fiord (*A. M. N.*), Mehavn * (*Nordgaard*).

27. *Bugula Murrayana* (Johnston).

In the fiords generally.

a. Var. *fruticosa*, Packard.

1863. *Menipea fruticosa*, Packard, "List Animals dredged Caribou Island, Southern Labrador," Canad. Naturalist and Geologist, vol. viii. p. 9 (separate copy), pl. i. fig. 3.
1867. *Bugula Murrayana*, var. *fruticosa*, Smitt, "Kritisk Förteckning, &c.," *l. c.* pl. xviii. fig. 23.

Varanger and Bög Fiords, 50–120 fathoms.

b. Var. *quadridentata*, Lovén (MS.).

Bugula Murrayana, var. *quadridentata*, Smitt, "Kritisk Förteckning, &c.," *l. c.* pl. xviii. figs. 25, 26.

Bög Fiord in 120 fathoms, with var. *fruticosa*, of which it is a very narrow form, not more than two zoœcia wide. Taken also by the Norwegian North Atlantic Expedition, Stat. 262, off Vardö, 148 fathoms.

Genus Carbasea, Gray, 1848.

= *Flustrina*, J. van Beneden, 1849, = *Semiflustra*, d'Orbigny, 1851.

I take this opportunity of making some remarks on this genus. *Carbasea* is one of the cases in which the structure of the polyzoary may be conveniently used as a generic character. One group of *Flustra* is composed of a double series of zoœcia, back to back, and these are typical of the genus; but another has invariably only a single layer of zoœcia, and these constitute Gray's genus *Carbasea*. The genus has five North Atlantic and Mediterranean representatives, viz. *Carbasea membranaceo-truncata*, Smitt (Arctic),

* Mehavn is a small village lying between Lakse Fiord and Tana Fiord.

C. pusilla, Hincks (Adriatic), *C. pedunculata*, Busk (about lat. 38° N. and long. 28° W., in 450–900 faths., 'Challenger'), *C. papyrea*, Pallas (Mediterranean), and *C. Solanderi*, nom. nov. (boreal). A few remarks on the last two species may here be added :—

Carbasea papyrea, Pallas.

1725. *Porus cervinus*, Marsillus, Hist. Phys. de la Mer, p. 64, pl. vi. figs. 25, 26.
1766. *Eschara papyrea*, Pallas, Elenchus Zoophyt. p. 56.
1767. *Flustra papyracea*, Linn. Syst. Nat. ed. xii. p. 1301.
1879. *Flustra carbasea* (nec Ellis & Sol.), Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 119.
1889. *Flustra papyracea*, Carus, Prod. Faun. Med. vol. ii. p. 9.
1896. *Flustra papyrea*, Waters, "Interzoœcial Intercommunication in Flustridæ and Notes on *Flustra*," Journ. Mic. Sci. p. 287.

Zoœcia rhombic or lozenge-shaped, being angled at the middle of their sides; of nearly the same length as those of *C. Solanderi*, being about 1 millim., but wider, 0·65 to 0·75 millim., narrowed both anteally and posteally, the greatest breadth being in the middle; the anterior extremity and oral opening markedly narrower than in *C. Solanderi*. Oœcia of moderate size, semiglobose, well raised.

Specimens in my collection are from Naples (Zool. Stat. sent as "*Flustra carbasea*") and Mediterranean (Mr. Waters as "*Flustra papyrea*," Pallas). The species is not only distinct with respect to the form of the zoœcium, but it is also furnished with oœcia, which are well represented on my Naples example, though Mr. Waters states that he has never seen any; while oœcia are unknown in *C. Solanderi*. Considering the date of the work of Marsillus, his figure gives an admirable idea of the form of the cells and the extent of variation in that form. A comparison of the two following passages is certainly curious :—"Attachées à la Roche, quoique sans Racine. J'en ai une en mon Cabinet, qui tient à l'écorce d'un petit Cancre" (Marsillus, A.D. 1725). "This is very common upon a Crab (*Pisa armata*), which usually carries a small colony of this *Flustra* on its back. I do not remember seeing any at Naples except from this Crab" (Waters, A.D. 1879). In this species Waters tells us that there are only one distal and two lateral rosette-plates, each with only a single pore.

28. *Carbasea Solanderi*, nom. nov.

1786. *Flustra carbasea*, Ellis and Solander, Nat. Hist. curious and uncommon Zoophytes, p. 14, pl. iii. figs. 6, 7 (et auct. plur.).
1848. *Carbasea papyracea*, Gray, List Brit. Anim. Brit. Mus., Centroniæ, p. 105 (nec *Flustra papyracea*, Linn.; nec *Flustra papyracea*, Ell. & Sol.).

1848. *Flustrina carbasea*, J. van Beneden, Bull. Acad. Roy. Belg. vol. xv. p. 651.
1851. *Semiflustra carbasea*, d'Orbigny, Palæont. Franç., Terr. Crét. vol. v. p. 326.
1867. *Flustra papyrea*, Smitt, "Krit. Förteck., &c." pp. 359 & 380, pl. xx. figs. 9–11 (nec *Eschara papyrea*, Pallas).

This species, which is also *Flustra papyrea* of Busk (B. M. Cat.) and *Flustra carbasea* of Hincks (Hist. Brit. Polyz.), is distinguished from *C. papyrea* by its loop-shaped or linguiform zoœcia, which are proportionately wider in front and narrower in the middle than in that species; and are entirely devoid of the angular projections in the middle of the lateral margins. Oœcia are not known to occur. Its distribution is boreal and arctic, from Britain to Spitsbergen and Greenland. In this species Waters describes numerous distal and six lateral rosette-plates—the former with a single pore, the latter with several pores.

Nordgaard records this species from Sværholtklubben.

29. *Carbasea membranaceo-truncata* (Smitt).

1867. *Flustra membranaceo-truncata*, Smitt, "Kritisk Förteck., &c." p. 358, pl. xx. figs. 1–5.
1884. *Flustra membranaceo-truncata*, Vigelius, Die Bryozoen 'Willem Barents,' p. 10, pls. i.–vi.

According to Waters this species has three distal and six lateral rosette-plates, all with only one pore. Vigelius (*l. c.*) has published a most elaborate memoir on this species. The margins of the zoœcia are typically quite unarmed, but in a specimen from 150 fathoms in the Varanger Fiord I find a spine on each side at the front corner of the lateral margins. In an example from Greenland similar spines occur, while they are wholly absent from other Greenlandic specimens, from those in my collection from the St. Lawrence, and from others kindly given me by the describer, Herr Smitt, from Finmark and Spitsbergen. Off Vardö, in 148 fathoms, 'Voringen' Expedition.

Genus Flustra, Linné.

30. *Flustra abyssicola*, M. Sars.

1872. *Flustra abyssicola*, G. O. Sars, 'Some remarkable Forms of Animal Life,' Christiania, p. 19, pl. ii. figs. 25–30.

Dredged by the 'Voringen' in 148 fathoms off Vadsö.

"Membranipora."

The so-called genus *Membranipora* contains a heterogeneous assemblage of forms which only agree in these particulars—namely, that a larger or smaller portion of the front wall consists of a membranous covering, and that the oral opening is generally of the simplest character in the anterior part of this membrane. It has always been a matter of surprise to me that, though Hincks removed two or three species to other genera, he left such a strange assemblage of forms to be associated with *Membranipora membranacea*. The explanation is, I suppose, that he relied almost entirely on the oral opening for the establishment of his genera. I cannot but think that in dividing this group use should be made of the presence or absence of the oœcium, for the mode of reproduction must be of more importance than most other characters. The character of the oœcium when present, and the partial or entire membranous epitheca, must be considered. The absence or presence of avicularia, their character, whether occupying a separate chamber or belonging to the zoœcium, their position and structure are more or less valuable according to other characters which accompany these differences. Mr. Waters, Herr Levinsen, and others have devoted much time and labour to the examination of the pore-chambers and rosettes: the former has summarized his observations in his paper "Observations on the Membraniporidæ," Journ. Linn. Soc., Zool. vol. xxvi. 1898, p. 654; and Herr Levinsen has given figures of the pore-chambers of several species in his excellent 'Zoologica Danica, Mosdyr,' 1894. In the preparation of this paper I have examined almost every northern species with respect to the pore-chambers, and have found them to be very valuable as generic characters. They are often very easily seen; but in some cases, though they exist in the walls of the zoœcia, they do not project beyond them and are then often very difficult to determine with certainty. I have used three methods in their examination: first, incineration; secondly, boiling in liquor potassæ; thirdly, placing in Eau de Javille. The use of the latter destroys not only the soft tissues but dissolves chitine, so that it must not be used when it is desired to observe the opercula.

I have illustrated the pore-chambers of several species, but have purposely omitted drawings of those species which Levinsen has already figured, unless the species is the type of a genus as here instituted.

I may mention two little matters which have struck me as interesting in my investigations:—

First, as to incineration. *Megapora ringens* is the only species which, when subjected to fire, has shrivelled up to nothing, yet when treated with Eau de Javille it is found to have a calcareous skeleton; while *Setosella vulnerata*, small as it is, has a strong calcareous front wall which resists fire; and *Membranipora membranacea* when burnt is shown to have a well-developed calcareous structure.

Secondly, it was a surprise to me to find that the largest of all our Cheilostomata, *Eschara foliacea*, as also its variety *fascialis* of the Mediterranean, when dissolved in nitric acid, should exhibit scarcely a trace of chitin, less so than in any other species which I have similarly treated. When the calcareous matter is got rid of scarcely a sign of anything is left except the opercula, which stand out entirely by themselves, so that no teasing is required or indeed could be applied.

Genus Hincksina*, gen. nov.

Zoœcia incrusting, having the entire area membranous, the margin surmounted by numerous spines. Oœcia small, short, and little raised. Avicularia occupying distinct cells sparingly scattered among the zoœcia, oval, with semicircular mandible. No pore-chambers.

Type, *Hincksina* (*Membranipora*) *flustroides*, Hincks.

This genus with its separate avicularian cells and absence of pore-chambers should, I think, be removed to the family Flustridæ. Waters mentions six lateral rosette-plates.

Genus Membranipora, Lamouroux.

Type, *Membranipora membranacea* (Linné).

The *Flustra membranacea*, Linné, has by general consent been accepted as the type of this genus. No other species placed in it by Hincks are congeneric or even belong to the same family. A family Calloporidæ with genus *Callopora* as type will include most of the genera provided with pore-chambers, &c.

Front wall entirely membranous; no oœcia; no avicularia (furnished with tower-cells of unknown use?). No pore-chambers. No lateral spines. Rosette-plates two distal, and two to four lateral, with many pores (*Waters*).

31. *Membranipora membranacea* (Linné).

Nordkyn (*Nordgaard*).

* After the author of 'British Marine Polyzoa.'

Genus Electra, Lamouroux, 1834.

Type, *Electra verticillata*, Lamouroux.

See Norman, "Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 113.

With respect to the synonyms I gave in the place referred to :—

1st, *Amphiblestrum*, Gray. All that I wrote in the note is, I believe, correct; but I have since examined the specimens in B. M. which Gray had named *A. membranacea*, Abild., and find that they are not that species, but the *Amphiblestrum Flemingii*, Busk. It seems to me therefore that the specimens should take precedence of the name erroneously given to them by Gray, and that the genus *Amphiblestrum* may be used in the sense in which Busk employed it, for although he makes no reference to the matter, he no doubt had himself examined these specimens in the British Museum.

2nd, *Conopeum*. I have re-examined the specimens in B. M. referred to this genus and find them, as I stated then from long memory, to be *M. Lacroixii*. If it should be deemed therefore at any time desirable to use a separate genus for that species, *Conopeum* is ready for the purpose.

This genus is not furnished with pore-chambers. At one time I was inclined to unite in one species *M. Lacroixii*, Audouin, and *M. monostachys*, Busk. They often occur together on the same oyster or other large shell, mingled in such a way as to be puzzling; but I am now satisfied as to their specific difference. I may here mention that I have failed to observe in any northern specimen examined by me such a back with lucid spots as that represented by Waters in his paper on the Membraniporidæ, pl. xlviii. figs. 14, 15, or such an operculum as he refers to *M. Lacroixii**; but I do see on most specimens examined the two processes at the distal extremity, which look as though they were for muscular attachment. The following I regard as some of the specific differences between *E. monostachys* and *E. Lacroixii*:—

Electra monostachys. Typically there is a single spine at

* I am indebted to Dr. Levinsen for a very interesting form of *E. monostachys* from Denmark which has a *calcareous* operculum, but of quite a different form from that figured by Waters and attributed to *Lacroixii*. I subsequently sent to Dr. Levinsen specimens of our British var. *fossaria*, Hincks, and he found them to agree with his variety from Denmark in having *calcareous* opercula &c. I may say that with respect to figures given by Levinsen in the 'Zoologica Danica, Mosdyr,' 1894, I should refer his figs. 37, 38, 40 to *E. monostachys* and fig. 39 to *E. Lacroixii*.

the lower margin of the area; when this is present it at once determines the species among northern forms. Under favourable conditions, more especially in young incrusting colonies, the lateral margins may be furnished with a pair of spines by the oral opening, or numerous spines all along the margin, but in these cases the basal spine is always the largest and characteristic. When the colony is entirely devoid of spines, it may be distinguished from *E. Lacroixii* by the lateral margins being smooth, except that their inner edge may be very slightly granulated, but the calcareous posterior portion of the front wall is *smooth*.

E. Lacroixii in favoured positions may have a few extremely fine and delicate spines on the lateral margins with the front pair of larger size, or these latter only present (but never the distinctive posterior central spine of *E. monostachys*). Apart from spines this species may be distinguished from the last by the coarsely granulated character of the entire margins, *including the whole portion posterior to the membranous area*. When present, moreover, the remarkable "hollow triangular spaces," scattered often in extraordinary numbers among the zoœcia, are at once distinctive. Hincks wrote of these: "They are not true avicularia, but consist of a three-cornered area inclosed by calcareous walls and covered in by a transparent membrane." The membrane is frequently destroyed, and they then appear as hollow triangular structures, which bear a general resemblance to a hollow occupied by a pointed form of avicularium.

M. Lacroixii and *M. monostachys* are only provisionally placed in the genus *Electra*: further observations are necessary to determine their position. In 1894 Levinsen united the three species *Lacroixii*, *monostachys*, and *catenularia*, Jameson, under the last name. *M. catenularia* is a species which in the boreal and arctic fauna appears to stand quite by itself. It has been placed by McCoy in a genus *Pyripora*.

32. *Electra pilosa*, Linné.

Nordkyn (*Nordgaard*).

Fam. Calloporidæ.

Genus Cauloramphus *, gen. nov.

Front wall entirely membranous, the calcareous border bearing spines. Avicularia stalked and situated among the

* καυλὸς, a stalk; ῥάμφος, a bird's beak.

spines on the lateral margin of the zoœcium (oœcia, when present, very shallow and inconspicuous). Pore-chambers in the type three pairs of lateral and one terminal; the latter is sometimes divided into two or even three small chambers.

Type, *Cauloramphus spinifer* (Johnston) (Pl. XIII. fig. 1).

33. *Cauloramphus cymbæformis* (Hincks).

1867. *Membranipora spinifera*, Smitt, "Kritisk Förteckning, &c." p. 366, pl. xx. fig. 32 (nec *M. spinifera*, Johnston).
1877. *Membranipora cymbæformis*, Hincks, "Polyzoa of Iceland and Labrador," Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 99.
1881. *Membranipora spinifera*, Vigelius, Zoologischen Ergebnisse 'Willem Barents,' Polyzoa, p. 12.
1887. *Membranipora cymbæformis*, Hincks, "Polyzoa of the St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 217, pl. xv. fig. 4.

Vardö, in 1890: when I took this species it was new to the Norwegian Fauna, but it has since been recorded by Nordgaard from Hammerfest. Specimens in my collection are also from Spitsbergen (*Smitt*) and the Gulf of St. Lawrence (*Dawson and Whiteaves*).

I have never seen this species on stone or shell; so far as my observations go, it grows either on branching Polyzoa or Hydroids.

Cauloramphus spinifer has not as yet occurred in Norway either to Nordgaard or myself; its most northern locality at present known to me is Shetland, but it will probably be yet found between tide-marks in Southern Norway.

Genus Callopora, J. E. Gray.

Callopora, Gray, List Brit. Anim. Brit. Mus., Centroniæ, 1848, pp. 109 & 146.

Type, *Callopora lineata*, Linné.

Front wall entirely membranous. Marginal walls more or less thickened and crowned with spines, which may be many or few. Oœcia globose, of good size, commonly with a rib across the front. Sessile avicularia with acute mandible at the bottom of the zoœcium and above the oœcium or in a lateral position on one or both sides of the oral opening, or in both positions in the same species. Usually two pairs of lateral pore-chambers and one distal; size and form of the chamber varying with the species *. In

* It will be understood that two pairs of lateral pore-chambers added to the pore-chambers on the other side of the walls of the hinder part of the zoœcium implies that there are at least four rosette-plates on the side.

C. unicornis pore-chambers are rarely developed, but sometimes one or two may be so.

I have examined the pore-chambers in the following species, which I would include in the genus. Two pairs of lateral and one distal pore-chambers are present in *lineata*, *craticula*, *Whiteavesii*, *Dumerilii*, *aurita*; two pairs of lateral and ? one distal (the latter not being clearly seen) occur in *Sophiæ*. Levinsen has placed *unicornis* among the species which have no pore-chambers; that is true as a rule, but rarely there is one chamber or one pair of lateral chambers, and rarely two pairs, and this applies also to var. *armifera*, Hincks. I have not been able to see the pore-chambers in *nigrans*, as it is usually loosely attached and the back is too solid and dark to enable the pore-chambers to be seen. Of *curvirostris* and *arctica* (Smitt) my specimens are too small to allow of sacrificing them; and *discreta*, Hincks, is unknown to me. In *craticula* and *Whiteavesii* the membranous area occupies only the central portion of the front wall, and outside the spines which surround it there is a calcareous crust of some breadth which completes the front wall.

34. *Callopora lineata* (Linné). (Pl. XIII. fig. 2.)

Vadsö, on seaweeds; stones and shells of *Buccinum grœnlundicum*, var. *nuda*; at Vardö on *Neptunea despecta*; also Svolvær and in Bergen and Hardanger Fiords. The East Finmark specimens which I have seen are remarkable from the absence of both oœcia and avicularia. Spitsbergen with oœcia and avicularia (from Smitt).

35. *Callopora craticula* (Alder). (Pl. XIII. fig. 3.)

Varanger Fiord in 100–125 fathoms; and I may add "Finmark" (*Smitt*, as "*M. lineata*"), West Greenland, 'Valorous,' Gulf of St. Lawrence (*Whiteaves*).

The figure of Hincks is not quite satisfactory: it does not illustrate how close the flattened glistening spines are to each other at their edges; nor does he show any avicularium at the top of the oœcium, which is its usual position. The spines in this species ordinarily almost meet and even cross in the centre, thus forming a kind of roof over the zoœcium; and if the tips of the spines coalesced we should have a *Membraniporella*, but in this case they do not show the slightest tendency to form union.

Callopora Whiteavesii, sp. n. (Pl. XIII. fig. 9.)

1867. *Membranipora lineata*, Smitt (partim), "Kritisk Förteckning, &c." pl. xx. fig. 26.

Zoœcia small, 0·5 millim., oval, each area with its own

distinct calcareous margin, margin of area in living specimens porcelain-white; surmounted by about fourteen to sixteen spines, which are short, slender, and almost upright, very easily abraded. Oœcium globose, porcellanous; either smooth (as in Smitt's figure) or having a raised pointed arch in front (somewhat as in *M. aurita*), caused by the incorporation of two of the spines into the front wall of the oœcium. Avicularia, if any, unknown.

As compared with its close ally, *C. craticula*, the zoœcia are larger (from the same district), the spines more slender and nearly upright, the oœcium without the rib, and avicularia are (apparently) altogether absent.

A peculiarity in this species is its appearance when the spines are all abraded; the membranous front wall appears thickened, and has a yellow and waxy appearance. It might be supposed to be chitinous, but it is dissolved away at once in acid, and only the primitive membrane remains. On the other hand, it is not destroyed by liquor potassæ, and thus it would appear that the strengthening material is calcareous.

Thirty-five miles off Cape Rozier, Gulf of St. Lawrence (*Whiteaves*, after whom I name the species); off Holsteinborg, Greenland, 57 fathoms, 'Valorous,' 1875; Spitsbergen (*Smitt*, as "*M. lineata*").

The species perhaps comes nearest to *M. discreta*, Hincks, but this Arctic form certainly is not remarkable for the margin being "cut into lobes" nor do the spines "incline inwards."

36. *Callopora Sophiæ*, Busk.

? 1851. *Reptoflustrina arctica*, d'Orbigny, Palæont. Franç., Terr. Crét. vol. v. Bryozoaires, p. 582.
1855. *Membranipora Sophiæ*, Busk, Quart. Journ. Micr. Sci. vol. iii. p. 255, pl. i. fig. 7.
1884. *Membranipora Sophiæ*, form *natura*, Hincks, "Polyzoa Queen Charlotte Islands," Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 9 (separate copy).
1886. *Membranipora arctica*, Lorenz, Bryoz. Jan Mayen, p. 8, pl. vii. fig. 1 (separate copy).
1900. *Membranipora arctica*, Waters, "Bryozoa from Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxviii. p. 60.

There are commonly two and sometimes three pairs of lateral spines, sometimes none are present. The lateral avicularia have the *mandible pointing upwards and inwards*. The oœcium ordinarily bears a semicircular rib (see Busk's original figure, and Smitt, fig. 24), but sometimes a pair of spines being taken into the front wall it presents an acute-angled rib instead. In the space between the zoœcia there

is often developed an acute mandibled avicularium, sometimes a raised process without avicularium (see Smitt, figs. 25 & 27, and Lorenz's figure); and when the zoœcium below a median avicularium bears an oœcium, the latter is tilted up, and the avicularian process is seen behind it at a lower level. In older specimens without oœcia the interzoœcial space has a raised wall inclosing a hollow space within it, most variable in shape (square, oblong, triangular, round, or crescentic), the avicularium is no longer seen, but in one or two instances I have seen the space covered with a membrane with a central opening or pore, in others instead of any hollow a large nodule with the avicularium on one side of it. The zoœcia in this species are smaller than in *C. unicornis*, var. *armifera*, from which it is most readily distinguished by the lateral avicularia having the mandible directed *upwards and inwards* (instead of *downwards and outwards*) : it seems but a small difference, but would appear to be constant.

When *C. Sophiæ* is found living in exposed situations, such as the shell of living *Neptunea despecta*, spines are not ordinarily seen, and the margin of the zoœcia becomes much thickened and strongly granulated.

The variations are very great. In some Spitsbergen specimens, for which I am indebted to Smitt, the whole space between the zoœcia is elevated into a flat-topped, nearly square, slab-like plate; at each corner of the slab is a lateral avicularium, those at the bottom of the slab belonging to the zoœcium below, and those at the top belonging to the alternating zoœcia on either side above; in front is seen the arch of the oœcium, which thus would seem to lie under the slab.

Varanger Fiord (*A. M. N.*), Sværholt (*Nordgaard*). Other specimens in my collection are from "Finmark" and Spitsbergen (*Smitt*), North Cape (*A. M. N.*), west of Holsteinborg, Greenland, in 57 fathoms ('Valorous,' 1875), Davis Strait (*A. Hancock*), Gulf of St. Lawrence (*Whiteaves*).

Callopora unicornis, Fleming, var. *armifera*, Hincks. (Pl. XIII. figs. 10, 11.)

1867. *Membranipora lineata*, forma *americana*, Smitt, "Kritisk Förteckning, &c." p. 366, pl. xx. fig. 31.
1880. *Membranipora armifera*, Hincks, "Contrib. gen. hist. Polyzoa," Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 82, pl. xi. fig. 5.
1892. *Membranipora armifera*, Hincks, "Polyzoa St. Lawrence," Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 155, pl. viii. fig. 4.
1898. *Membranipora Sophiæ*, var. *armifera*, Waters, "Observations on the Membraniporidæ," Journ. Linn. Soc., Zool. vol. xxvi. p. 860, pl. xlviii. fig. 18.

At the outset let me say that I consider that Hincks's *M. armifera* has nothing to do with *C. Sophiæ*, with which Waters has united it. It can at once be distinguished by the avicularia on the sides of the oral opening, which in the former *point downwards and outwards*, and in the latter point *upwards and inwards*. An examination of specimens from many localities proves that this is an unvarying rule. Secondly, let me add that, notwithstanding the presence of these lateral avicularia in *M. armifera*, I am unable to regard it as more than a very interesting Arctic form of *C. unicornis*, Fleming. I arrive at this conclusion because it resembles *unicornis*—and it alone among allies—in usually possessing no pore-chambers; in the form of the oœcium and its surmounting avicularium; in the presence sometimes of a pair of lateral spines, of which one is of moderate length and acutely pointed at the end, while that which is opposite to it is immensely developed, of great length, and in the form of a hollow tube.

The peculiarity which at once distinguishes it from typical *C. unicornis* is the presence of avicularia at the sides of the oral opening (see Pl. XIII. figs. 10, 11) with the mandible pointing downwards and outwards. Commonly these avicularia are on each side: sometimes on one side only and on the other a spine; sometimes over considerable spaces, or a whole polyzoary, they are altogether absent. I have never seen both avicularia and both lateral spines developed on the same zoœcium; the former when present would seem to supersede the latter. Besides the lateral pair of spines there is, at each corner of the upper margin, a small spine, and these spines often remain buried in the oœcium, in which minute round holes (for the spines are hollow) seen at the lower corners of the oœcium indicate their presence. The oœcium is similar to that of *C. unicornis*, with a similar arched rib in front; and, as in that species, at the base of the zoœcium is an avicularium of considerable size and pointed mandible; when the oœcium is developed this avicularium is seen above and appears to be part of it. Occasionally this avicularium attains immense size (see Hincks's figure in his paper of 1892 and my figure, Pl. XIII. fig. 11). My specimen, which has these very large avicularia, is from Torske Bank, West Greenland, and all the avicularia over the zoarium are of the same abnormal size. Now it is curious that this zoarium should have been found on a large valve of *Pecten islandicus*, and that on the other parts of the same valve were two other zoaria of the same species, on which the oœcia were of the normal dimensions (Pl. XIII.

fig. 10). The length of a zoœcium is about 0·8 millim., while that of *C. unicornis* is 0·6 millim.; but there is considerable variation in the size of both forms.

E. unicornis, var. *armifera*, is in my collection from the following localities:—Spitsbergen (Smitt as "*Membranipora unicornis*"); Upper Torske Bank, W. Greenland ('Valorous,' 1875); Gulf of St. Lawrence (*Whiteaves*); Nantucket, N.E. America (received among some unnamed specimens from Prof. Verrill).

One difficulty presented to us in studying the Polyzoa is the circumstance that all the zoœcia in a polyzoary imitate any marked peculiarity of varietal characters which is developed on the earliest zoœcia; and thus, without a series of specimens to show the connecting-links, such a specimen may be regarded as possessing more permanent characters than it is entitled to: the two forms of this species on the *Pecten* from the Torske Bank are a case in point, which might be multiplied endlessly. Even if the earliest zoœcia are of smaller or larger size than usual, the whole colony will follow suit and maintain that dimension. I have made some observations on this subject in my paper "A Month on the Trondhjem Fiord," when treating of *Electra pilosa* (Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. 1893, pp. 121, 122).

Callopora nigrans, Hincks. (Figs. 1, 2.) *

? 1851. *Reptoflustrella americana*, d'Orbigny, Palæont. Franc., Terr. Crét. vol. v. p. 571.

1867. *Membranipora lineata*, forma *americana*, Smitt, "Kritisk Förteckning, &c." p. 266 (*partim, nec figuræ*).

1882. *Membranipora nigrans*, Hincks, "Polyzoa Charlotte Islands," Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 9 (separate copy), pl. xix. fig. 2.

1900. *Membranipora macilenta*, Waters, "Bryozoa Franz-Josef Land," Journ. Linn. Soc., Zool. vol. xxxviii. p. 61, pl. viii. fig. 10.

Zoœcia very large, commonly 0·8 and 0·9 millim., ovate (oblong or linguiform when crowded), margin crenated; oral opening large, semicircular; a lateral avicularium is soon developed high up on each side, with acute mandible pointing obliquely downwards. The zoœcium is now in the condition in which it is represented by Waters and my fig. 1 *b*. Next, above the zoœcium is produced a transversely oblong fillet, the margins of which are slightly raised, so that there is a slight hollow on the middle portion, and the distal corners are rounded off (see fig. 2 *a*). Next, upon the

* Figures of this species will be given with the next part; those here mentioned refer to them.

rounded corners there grow out nodulous processes, sometimes of very considerable size, and the slight central hollow is filled up; the structure now assumes the form of fig. 2 *c*. When this nodulous growth is fully developed the zoarium has a very peculiar appearance, and reminds us somewhat of *C. aurita*, for the lateral avicularia of the two alternating zoœcia above nearly meet, and rarely actually coalesce with the nodulous interzoœcial growth which has been described. The foregoing would appear to be a peculiar form of oœcium and it is that which is the common one found in the species. Very rarely, so far as my observations go, the form of a shallow cap is taken on (fig. 2 *a*), and this is the oœcium, which Hincks figured from the Charlotte Isles. On one portion of my specimen from the 'Vega' Expedition a very different form of oœcium is found (fig. 1 *c*): I have seen it only on zoœcia in which the usual lateral avicularia are absent. The form taken reminds one of a "fool's cap," the front rim of which is well rounded; from this the oœcium narrows gradually, and at the same time is also more depressed, until it ends in a nodulous process. There are perhaps twenty such oœcia together, though there is considerable variation in their exact length; close to them are, on other zoœcia, oœcia of the ordinary form (fig. 2 *b*).

This is a very large species, which grows most luxuriantly and is generally only loosely attached to the object on which it is developed. It is of a rich deep brown colour, Hincks says "deep black," but, notwithstanding that statement, he has given it a very expressive specific name in "*nigrans*." I have compared my specimens with the type of Hincks, from the Charlotte Islands, which is now in the British Museum; and the 'Vega' locality, which I shall presently give, affords additional evidence that it is a circumpolar form.

It may be the *Reptoflustrina americana* of d'Orbigny. Smitt refers to that species, which was found at Newfoundland, and he also states that the species from Labrador which Packard recorded under the name "?*Lacroixii*," but without any description, was, from specimens sent to him by that writer, identical with what he calls "*forma americana*." It must remain in some doubt to which of two forms Smitt in that statement refers, for while his fig. 31 with its large avicularia on the ovicells undoubtedly represents what I have here described as *C. unicornis*, var. *armifera*, specimens which he kindly sent to me named "*forma americana*" are as undoubtedly that which I here refer to *C. nigrans*, Hincks, which, among other marked characters, never has large avicularia on the oœcia.

Specimens here described are from Spitsbergen (*Smitt*), and others were found growing luxuriantly on a shell of *Neptunea fornicata*, given me by Prof. Lovén, from the Stockholm Museum, and which was dredged by the 'Vega,' lat. 66° 58′ N., long. 171° 35′ E., that is, in Bering Strait; while the type described by Hincks came from Queen Charlotte Islands, and the early stage of development figured by Waters from Franz-Josef Land. It is thus a circumpolar form.

Genus Oochilina, gen. nov.

Type, *Oochilina* (*Membranipora*) *crassimarginata*, Hincks.

Zoœcia with front wall entirely membranous, ovate (long ovate or short ovate, more rarely linguiform), depressed, with crenated or smooth margin, no lateral spines. A round, oval, or oblong avicularian chamber developed between and taking the place of a zoœcium; avicularium typically with a complete bar, the mandible rounded (or acute). Oœcium semiglobose. (Pore-chambers ?)

Besides *O. crassimarginata* and *O. tensa*, the following are apparently referable to this genus: *M. tenuirostris, velata, plana*, and *valde-munita*, of Hincks; *M. papulifera* and *Biflustra perfragilis*, MacGillivray; and perhaps *M. gregaria*, Heller.

The bar of the avicularium is complete and the mandible rounded in *O. crassimarginata* and *O. tensa*; but the bar is incomplete and the mandible acute in some of the species which I have temporarily assigned to the genus.

Oochilina tensa, sp. n. (Pl. XIII. fig. 12.)

Spreading on stones as a thin coating in large patches. Zoœcia normally oval, but owing to pressure on each other, &c., they assume various forms—nearly oblong, linguiform, or lozenge-shaped; the frontal membrane is very thin, delicate, and transparent; the side walls are lightly formed, only showing symptoms here and there of crenulation of the border. In a separate chamber between the zoœcia is situated an avicularium, small and not nearly occupying the whole of the top of the chamber; the bar complete, the mandible rounded; the avicularium is perpendicularly placed. Oœcia subglobose, well raised, porcellanous, and of a milk-white colour and smooth surface.

On pieces of stone, chiefly granite; dredged in the Bergen Fiord in 1878, and in the Hardanger Fiord in 1879.

It would be very easy to mistake this delicate creeping form for incrusting *Flustra Barleei*, but in that species the avicularium holds a decidedly oblique position, and the

oœcia are not prominently raised and are also smaller in size than in this species.

Genus Ellisina *.

Type, *Ellisina* (*Membranipora*) *levata*, Hincks.

Differs from *Oochilina* in not having avicularia occupying separate cells between the zoœcia; but, instead, furnished with avicularia, ovoid or triangular, situated on the hinder portion of the zoœcium. The oœcium is well developed, typically with a flattened area on its front. In the type species the pore-chambers are very large (Pl. XIII. fig. 4): one distal; the position of the remaining chambers is very unusual, the two front lateral pairs project *outside* the side walls; and the two posterior pairs are seen *inside* the side walls, which is the reverse of the usual rule.

Membranipora albida, *coronata*, and *minuscula* of Hincks, and *M. incrustans*, Waters, would seem to belong to this genus.

Genus Alderina †, gen. nov.

Front wall entirely membranous, side walls usually crenulated; no lateral spines. No avicularia (but nodulous processes sometimes developed in different positions on the side of the zoœcium). Oœcium usually bearing (either a rib or) a depressed area in front. Pore-chambers in the type, two pair of lateral and two distinctly marked and separated distal (well figured by Levinson, Zool. Dan., Mosdyr, 1894, pl. iv. fig. 27). As in *Ellisina*, the two front pairs of pore-chambers usually extend outside the lateral walls, and the two posterior inside.

Type, *Alderina* (*Membranipora*) *imbellis*, Hincks.

I provisionally place *M. solidula* in this genus, but it differs considerably from the type. The parts of the generic description which are in brackets apply to it, and not to *A. imbellis*.

Pl. XIII. fig. 8 represents the front portion of a young zoœcium at the edge of the zoarium of *A. solidula*.

Genus Amphiblestrum, Gray.

Type, *Amphiblestrum Flemingii*, Busk ‡. (Pl. XIII. fig. 5.)

Hinder portion of the area covered with a calcareous

* After John Ellis, the old and excellent author on "Corallines."

† Named after that excellent naturalist, J. Alder, the dearly loved friend of bygone years.

‡ See Busk, Report 'Challenger' Exped., Polyzoa, 1884, p. 65.

crust; in front of this a considerable portion of the area, typically trifoliate, but sometimes semielliptic or subrotund, is covered only by a thin membrane, at the distal extremity of which is situated the simple oral opening. Margin of zoœcium thickened, often granulated, sometimes bearing a pair (or more) of lateral spines; oral spines found in young specimens. Reproduction by means of prominent oœcia. Sessile avicularia often present, sometimes one, sometimes two on the hinder portion of the zoœcium. Pore-chambers: two pairs of lateral and one distal.

The pore-chambers are very conspicuous in *M. Flemingii*, but narrow and difficult to see (if always present?) in *M. trifolium*.

37. **Amphiblestrum trifolium* (Busk). (Pl. XIII. fig. 6.)

Svolvær, Lofoten Islands; not yet found in East Finmark. Other specimens in my collection are from Shetland, type and var. *quadrata* (*A. M. N.*); Wick, N.B., var. *quadrata* (*C. Peach*); Adriatic as "*M. Flemingii*" (*Prof. Heller*); Bergen Fiord, Norway (*A. M. N.*); Greenland ('Valorous,' 1875); Gulf of St. Lawrence (*Whiteaves*).

Genus Ramphonotus, Norman, 1894.

Type, *Ramphonotus minax* (Busk).

The zoœcia, if developed freely in form, are pyriform, widening upwards from the base, with a calcareous portion posterior to, and occupying a larger part of the front wall than that of, the membranous portion; the membranous portion of the area is nearly as wide as long, and often somewhat trifoliate in shape, the mouth-opening is simple and, as usual, close to its anterior margin; the border surrounding the membranous area is calcareous. There may be lateral spines. Oœcia large, globose, and imperforate. An acute bird's-beak-like avicularium mounted on a pedicel, with acute mandible of large size (often monstrously so), would seem to be habitually developed on the adult zoœcium, situated on the central portion of the zoœcium on, or immediately behind, the hinder margin of the area. [Zoarium incrusting in type species.] Pore-chambers: two pairs of lateral and one distal—the former very narrow and rarely extending beyond the side walls; the latter small and apparently sometimes not present.

38. *Ramphonotus minax* (Busk). (Pl. XIII. fig. 7.)

1867. *Membranipora Flemingii*, forma *minax*, Smitt, "Kritisk Förteckning, &c." p. 367, pl. xx. figs. 13, 14.

1880. *Membranipora princeps*, Hincks, Brit. Polyz., Introduction, p. lxxiii, woodcut xxxv.
1880. *Membranipora minax*, Hincks, Brit. Polyz., Introduction, p. lxxi, woodcut xxx. *a*, and p. 169, pl. xxii. figs. 2, 2 *a–c*.
1894. *Ramphonotus minax*, Norman, "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. p. 122.

Sværholt, East Finmark (*Nordgaard*). Specimens in my collection are from Shetland; Bergen and Trondhjem Fiords, Norway (*A. M. N.*); Gulf of St. Lawrence (*Whiteaves*). The specimens from the St. Lawrence have the zoœcia of very much larger size than those from the other localities.

It escaped my memory when I was writing my Trondhjem Fiord report that Hincks had, in the introduction to his work, called attention to the remarkable avicularium in this species, and had given the form in which the avicularium is fully developed a different specific name (*M. princeps*, see p. lxxiii, note); but a comparison of his woodcuts xxx. *a* and xxxv. will indicate, what is really the case, that the latter is only the more developed state of the former; and although on many polyzoaries only the first form will be found, the latter occurs both on Shetland and Norwegian specimens in my collection. The avicularia are very easily abraded in this species; and polyzoaries always have far more of the holes which indicate where avicularia have been than avicularia actually present (see Hincks, pl. xxii. fig. 2; no perfect avicularium is here shown).

DESCRIPTION OF PLATE XIII.

This Plate is chiefly occupied with figures of the backs of certain species in order to illustrate the pore-chambers. They must be regarded as in a great measure diagrammatic; for whereas in some species the pore-chambers are seen very easily, in other cases they are so hidden in the side walls that they are very difficult to observe.

Fig. 1. Pore-chambers of *Cauloramphus spinifer*.
2. „ „ *Callopora lineata*.
3. „ „ *Callopora craticula*.
4. „ „ *Ellisina levata*.
5. „ „ *Amphiblestrum Flemingii*.
6. „ „ *Amphiblestrum trifolium*.
7. „ „ *Ramphonotus minax*.
8. „ „ *Alderina solidula*; a young zoœcium at the edge of a zoarium.
9. Zoœcium of *Callopora Whiteavsii*, sp. n.
10. Zoœcium of *Callopora unicornis*, var. *armifera*, Hincks, with the usual avicularia.
11. Zoœcium of the same, the last with gigantic avicularium on oœcium.
12. *Oochilina tensa*, sp. n.